

The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.

Paper No. 13

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte MINH VAN NGO
and PIN-CHIN CONNIE WANG

Appeal No. 2003-1206
Application No. 09/773,063

ON BRIEF

Before OWENS, KRATZ and TIMM, Administrative Patent Judges.
KRATZ, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on appeal from the examiner's final rejection of claims 1-8. Claims 9-20, which are all of the other claims pending in this application, have been withdrawn from further consideration by the examiner as drawn to a non-elected invention.

BACKGROUND

Appellants' invention relates to an integrated circuit device including a barrier metal oxide interconnect cap recessed in a dielectric layer opening or channel oxide layer opening over

a conductor core filling, with a capping layer disposed over the interconnect cap. An understanding of the invention can be derived from a reading of exemplary claim 1, which is reproduced below.

1. An integrated circuit comprising:

a semiconductor substrate having a semiconductor device provided thereon;

a dielectric layer formed on the semiconductor substrate having an opening provided therein;

a conductor core filling the opening and connected to the semiconductor device;

a barrier metal oxide interconnect cap disposed over the conductor core and recessed in the opening in the dielectric layer; and

a capping layer disposed over the barrier metal oxide interconnect cap.

In addition to alleged admitted prior art, the prior art references of record relied upon by the examiner in rejecting the appealed claims are:

Hong et al. (Hong)	6,077,774	Jun. 20, 2000
Liu et al. (Liu)	6,181,013	Jan. 30, 2001 (filed Mar. 13, 2000)

Claims 1-8 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over alleged admitted prior art in drawing figures 1 and 2 and as described at pages 5 and 6 of appellants' specification (APA) in view of Hong and Liu.

We refer to the brief and reply brief and to the answer for a complete exposition of the opposing viewpoints expressed by appellants and the examiner concerning the issues before us on this appeal.

OPINION

Upon careful review of the respective positions advanced by appellants and the examiner with respect to the rejections that are before us for review, we find ourselves in agreement with appellants' viewpoint in that the examiner has failed to carry the burden of establishing a prima facie case of obviousness. See In re Oetiker, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992); In re Piasecki, 745 F.2d 1468, 1471-1472, 223 USPQ 785, 787-788 (Fed. Cir. 1984). Accordingly, we will not sustain the examiner's rejection.

The examiner essentially acknowledges that the applied APA does not disclose a barrier metal oxide interconnect cap disposed

over a conductor core in an opening. In an attempt at remedying the deficiencies in the teachings of the applied APA, the examiner additionally relies on Hong and Liu.

Hong discloses the use of a top barrier layer (34, Fig. 1F) that may be an metal oxide, such as TiO_2 , over a conductor (30, Fig. 1F) to prevent metal atoms from diffusing out of the metal conductor. See, e.g., column 5, lines 19-27 of Hong. The barrier is formed after a second dielectric layer is deposited on a barrier precursor or gas treated layer (32, Fig. 1E). See, e.g., column 4, line 53 through column 5, line 18 of Hong. Hong's top metal barrier (34) is not recessed as required by the appealed claims.

Liu discloses the selective growth of a copper passivation layer 24, which layer is treated by a chemical mechanical polishing (CMP) step until the passivation layer is coplanar with a dielectric layer surface leaving a thin layer of the passivation layer in a trench to protect an underlying copper conductor from corrosion. See, e.g., Figures 1E and 1F of Liu and the corresponding description thereof in the patent specification.

According to the examiner, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the APA device by including a metal oxide barrier such as taught by Hong disposed underneath the capping layer (124, Fig. 2) of the APA but over the conductive core (136, Fig. 2) so as to prevent metal atoms from diffusing out of the metal conductor of the APA as taught by Hong. Furthermore, the examiner relies on Liu in combination with both APA and Hong. The examiner maintains that it would have been obvious to one of ordinary skill in the art at the time the invention was made to further modify the proposed combination of Hong and APA, as discussed above, by recessing a barrier metal oxide interconnect cap in the opening that is filled with conductive material in APA to better protect the conductor from corrosion, which is the purpose of the passivation layer of Liu.

As part of meeting the initial burden of establishing a prima facie case of obviousness, the examiner must determine whether the differences between the subject matter of the claims and the prior art "are such that the subject matter as a whole would have been obvious at the time the invention was made to a

person having ordinary skill in the art" (emphasis added).

35 U.S.C. § 103(a) (1999); Graham v. John Deere Co., 383 U.S. 1, 14, 148 USPQ 459, 465 (1966).

Here, as pointed out by the appellants in their briefs, the examiner has not established any convincing reason, suggestion or motivation for combining both of Hong and Liu with the APA in a manner so as to arrive at the claimed subject matter. Concerning this matter, the examiner has not carried the burden of reasonably showing why one of ordinary skill in the art would have employed the teachings of Liu concerning a passivation layer to prevent corrosion of a conductor to modify APA with or without Hong in the manner proposed. As noted by appellants in the briefs, the examiner has not identified any need for additional corrosion protection for the device of APA that already includes a capping layer. Nor has the examiner identified why the device of Hong needs such protection since Hong covers the conductive material with a barrier (34) and dielectric layer (36) as shown in drawing figure 1F. More specifically, the examiner has not established how the teachings of Hong with respect to the formation of a diffusion barrier over a conductor and under a dielectric material are compatible with Liu's teachings of a passivation layer formed directly on the conductive material.

The examiner has not adequately explained why one of ordinary skill in the art would turn to the disparate disclosures of the applied references and significantly modify the APA device in a fashion so as to arrive at the here claimed subject matter based on the teachings of the applied references. Rejections based on § 103(a) must rest on a factual basis with these facts being interpreted without hindsight reconstruction of the invention from the prior art. See In re Warner, 379 F.2d 1011, 1017, 154 USPQ 173, 177 (CCPA 1967), cert. denied, 389 U.S. 1057 (1968). Our reviewing court has repeatedly cautioned against employing hindsight by using the appellants' disclosure as a blueprint to reconstruct the claimed invention from the isolated teachings of the prior art. See, e.g., Grain Processing Corp. v. American Maize-Products Co., 840 F.2d 902, 907, 5 USPQ2d 1788, 1792 (Fed. Cir. 1988).

From our perspective, the examiner's rejections appear to be premised on impermissible hindsight reasoning. On the record of this appeal, it is our view that the examiner has not carried the burden of establishing a prima facie case of obviousness with respect to the subject matter defined by the appealed claims.

Accordingly, we reverse the stated rejection.

CONCLUSION

The decision of the examiner to reject claims 1-8 under 35 U.S.C. § 103(a) as being unpatentable over APA in view of Hong and Liu is reversed.

REVERSED

TERRY J. OWENS)	
Administrative Patent Judge)	
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)	BOARD OF PATENT
PETER F. KRATZ)	APPEALS
Administrative Patent Judge)	AND
)	INTERFERENCES
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CATHERINE TIMM)	
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Appeal No. 2003-1206
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Page 9

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